

IN THE CLAIMS

The following claims replace the previous claims in this application.

1. (Previously presented) A system for modifying a time-base of a digital video stream; the system including an encoding device and a storage device connected via a digital video communication system, and a decoder/renderer;

the encoding device including:

an input for receiving an input video signal, and an input frame signal (vsync) synchronous to and indicating frame boundaries in the input video signal;

an encoder for converting the input video signal and input frame signal to a corresponding digital video stream complying with a predetermined video encoding standard; the encoder including:

a encoder clock complying with the video encoding standard;

the digital video stream including:

a sequence of digital video frames corresponding to received input video frames; a sequence of program clock reference stamps (PCR) representing a clock signal of the encoder clock; and a sequence of video presentation time stamps (PTS) each associated with a respective digital video frame and representing a value of a counter driven by the clock signal at a moment of receipt of an input video frame that corresponds to the digital video frame; and

an output for providing the digital video stream via the digital video communication system;

the storage device including:

an input for receiving the digital video stream via the digital video communication system;

a time-base modifier operative to:

low-pass filter the received video presentation time stamps;

replace, in the digital video stream input to the storage device, the video presentation time stamps (PTS) by respective modified video presentation time stamps (M-PTS) based on a constant predetermined frame-time between successive presentation time stamps, and

replace the program clock reference stamps (PCR) by respective modified program clock reference stamps (M-PCR) by scaling the program clock reference stamps (PCR) using a scaling factor that depends on a ratio of an expected time between a video presentation time stamp j and a preceding video presentation time stamp $j-n$ and an actual time between the video presentation time stamp j and the preceding video presentation time stamp $j-n$, where $j > n > 0$, and the expected time is n times the predetermined frame time, thereby forming a time-base modified video stream, wherein a clock unit operative to generate a clock signal locked to the filtered video presentation time stamps (PTS) using an error signal that depends on the scaling factor; the modified program clock reference stamps (M-PCR) being obtained by sampling a counter driven by the clock signal at a moment of receipt of the program clock reference (PCR);

a storage for storing at least a part of the time-base modified video stream; and

an output for providing said part of the time-base modified video stream from the storage device to the decoder/renderer; and

the decoder/renderer including an input for receiving said part of the time-base modified video stream from the storage device and being operative to decode the time-base modified video stream received from the storage device to enable rendering of the digital video frames in the stream synchronous with the respective associated modified video presentation time stamps.

2. (Cancelled)

3. (Cancelled) .
4. (Previously presented) The system as claimed in claim 1, wherein the time-base modifier is operative to low-pass filter the scaling factor.
5. (Previously presented) The system as claimed in claim 1, wherein the digital video stream includes information on a nominal frame rate of the video signal and the time-base modifier is operative to derive the predetermined frame time from the digital video stream.
6. (Previously presented) The system as claimed in claim 1, wherein the input of the encoding device is operative to receive an analog audio signal; the encoding device further including a sampler for sampling the received analog audio signal under control of a sampling clock signal that is derived from the video input signal and locked onto the input frame signal (vsync); and wherein the encoder is operative to convert the sampled audio signal into a time sequence of corresponding audio frames and insert the audio frames and respective audio presentation time stamps (A-PTS) in the digital video signal stream.
7. (Previously presented) The system as claimed in claim 6, wherein the time-base modifier is operative to replace the audio presentation time stamps (A-PTS) by modified audio presentation time stamps (MA-PTS) by scaling the audio presentation time stamps (A-PTS) using the scaling factor.
8. (Previously presented) The system as claimed in claim 1, wherein the storage device is operative to time stamp each packet of the digital video stream on receipt of the packet; to store each time stamp in the storage in association with the corresponding

received packet; and to output packets of the stored stream according to the respective time stamps and a predetermined delay.

9. (Previously presented) The system as claimed in claim 8, wherein the storage device includes a clock for providing timing signals and the storage device being operative to use as the time stamps stored in the storage the timing signal scaled using the scaling factor.

10. (Previously presented) The system as claimed in claim 1, wherein the storage device is operative to use as the time stamps stored in the storage a counter value from a counter driven by the clock signal locked to the received video presentation time stamps (PTS).

11. (Previously presented) The system as claimed in claim 1, wherein the video encoding standard is MPEG2.

12. (Previously presented) The system as claimed in claim 1, wherein the digital video communication system includes an isochronous communication channel for transferring the digital video stream.

13. (Previously presented) A storage device for use in a receiving system; the storage device including:

an input for receiving a digital video stream complying with a predetermined video encoding standard via a digital video communication system; the digital video stream including: a sequence of digital video frames; a sequence of program clock reference stamps (PCR) representing a clock signal of an encoder clock; and a sequence of video presentation time stamps (PTS) each associated with a respective digital video frame;

a time-base modifier operative to:

low-pass filter the received video presentation time stamps;

replace the video presentation time stamps (PTS) by respective modified video presentation time stamps (M-PTS) based on a constant predetermined frame time between successive presentation time stamps; and

replace the program clock reference stamps (PCR) by respective modified program clock reference stamps (M-PCR) by scaling the program clock reference stamps (PCR) using a scaling factor that depends on a ratio of an expected time between a video presentation time stamp j and a preceding video presentation time stamp $j-n$ and an actual time between the video presentation time stamp j and the preceding video presentation time stamp $j-n$, where $j > n > 0$, and the expected time is n times the predetermined frame time, wherein a clock unit operative to generate a clock signal locked to the filtered video presentation time stamps (PTS) using an error signal that depends on the scaling factor; the modified program clock reference stamps (M-PCR) being obtained by sampling a counter driven by the clock signal at a moment of receipt of the program clock reference (PCR);

a storage for storing at least a part of the time-base modified video stream; and

an output for providing a video stream from the storage device.

14. (Cancelled)

15. (currently amended) A method, executable on a processor, for modifying a time-base of a digital video stream that complies with a predetermined video encoding standard and includes a sequence of digital video frames, a sequence of program clock reference stamps (PCR) representing a clock signal of an encoder clock, and a sequence of video presentation time stamps (PTS) each associated with a respective digital video frame; the method including:

low-pass filter—filtering the received video presentation time stamps;

replacing the video presentation time stamps (PTS) by respective modified video presentation time stamps (M-PTS) based on a constant predetermined frame time between successive presentation time stamps; and

replacing the program clock reference stamps (PCR) by respective modified program clock reference stamps (M-PCR) by scaling the program clock reference stamps (PCR) using a scaling factor that depends on a ratio of an expected time between a video presentation time stamp j and a preceding video presentation time stamp j-n and an actual time between the video presentation time stamp j and the preceding video presentation time stamp j-n, where $j \geq n > 0$, and the expected time is n times the predetermined frame time; and

locking a clock signal to the filtered received video presentation time stamps (PTS) using an error signal that depends on the scaling factor; the modified program clock reference stamps (M-PCR) being obtained by sampling a counter driven by the clock signal at a moment of receipt of the program clock reference (PCR).

16. (currently amended) A tangible computer program product with variations of physical properties that interact with processing apparatus and are operative to cause a processor of the processing apparatus to perform the a method for modifying a time-base of a digital video stream that complies with a predetermined video encoding standard and includes a sequence of digital video frames, a sequence of program clock reference stamps (PCR) representing a clock signal of an encoder clock, and a sequence of video presentation time stamps (PTS) each associated with a respective digital video frame, the method comprising:

low-pass filter—filtering the received video presentation time stamps present in a video stream;

replacing the received video presentation time stamps (PTS) by respective modified video presentation time stamps (M-PTS) based on a constant predetermined frame time between successive presentation time stamps; and

replacing program clock reference stamps (PCR) by respective modified program clock reference stamps (M-PCR) by scaling the program clock reference stamps (PCR) using a scaling factor that depends on a ratio of an expected time between a video presentation time stamp j and a preceding video presentation time stamp $j-n$ and an actual time between the video presentation time stamp j and the preceding video presentation time stamp $j-n$, where $j > n > 0$, and the expected time is n times the predetermined frame time; and

locking a clock signal to the filtered video presentation time stamps (PTS) using an error signal that depends on the scaling factor; the modified program clock reference stamps (M-PCR) being obtained by sampling a counter driven by the clock signal at a moment of receipt of the program clock reference (PCR).